

4. Establishing the Basis for Air Quality Improvement leading to Ozone Standard Attainment

“Showing Real and Permanent Emission Reductions as the Basis for Ozone AQ Improvement in the Nonattainment Areas”

- ❖ Redesignation Emission Inventory Summaries – 1990 Historic Baseline, 1999 Redesignation Baseline, 2007 Projected Attainment, 2012 Projected Maintenance
- ❖ Estimated Control Program Impact on Relative Emissions – VOC & NO_x

Key Points:

- *Provide a summary of Major Sector Historic Inventories and Current Projections for 1990, 1999, 2007, 2012 for the composite area and for the discrete nonattainment areas*
- *Provide technical support for “Real, Permanent and Enforceable Reductions” test*
- *Provide technical support for the later “Attainment Maintenance Plan” demonstration*

A Introduction – Permanent Air Quality Improvement

This chapter provides an overview of the emissions inventories used to demonstrate permanent air quality improvement along with a review of the standing ozone control plan for eastern Wisconsin.

The Clean Air Act (CAA) requires areas requesting redesignation to attainment from nonattainment status to show that the air quality improvement is based on permanent rather than transitional circumstances. The overall permanence of air quality improvement obviously can't be guaranteed, but strong indicators include long term monitored trend analyses like those noted in Chapter 3 combined with showings of emissions trends for the primary chemical precursors to ozone – VOC and NO_x.

A major basis for the historic emissions estimates and emission projections into the future is characterization of the impact of formal emission control programs contained in the states' ozone control plans (State Implementation Plans or SIPs). Another basis is the accurate reflection of major fuel use and technology change trends for the economic sectors responsible for anthropogenic (human-generated) emissions in the region.

There are some transitional circumstances that might improve air quality include but not guarantee that improvement into the future. Among others, these include:

- a series of cool summers based on unique meteorology
- volcanic activity or the like affecting hemispheric climate in the short term
- extended economic recession reflected in lowered emissions generation activity across a large metropolitan area
- extreme energy/fuel cost markets that lead to temporary travel and/or electric generation reduction.

Part of the required “real improvement” showing includes a brief review of such economics and meteorology for the period of concern to discount these potential impacts from the monitored air quality. The period in question for this showing is the time-frame between designation to nonattainment (1987-1989) and monitored attainment. (1999-2001).

The CAA requires that areas seeking redesignation also demonstrate projected attainment into the future. A formal 10-year maintenance projection is part of the redesignation package along with a commitment to pursue a similar 10-year projection prior to the end of this maintenance period. If the redesignation request is approved during 2002, the commitment is for the production of a new projection by 2010 (*8 years into the current maintenance window and 2 years before the end of it*).

For the ease of review, the emission inventory portions of this Maintenance Plan are incorporated with the “real and permanent” inventory showing of this chapter. The overall maintenance plan and its contingent control plan are addressed in the next chapter.

B Redesignation Inventories Overview

For comparability and relative consistency to other ozone inventory efforts, Wisconsin selected 1990 for the historic inventory and 1999 for the “redesignation” inventory. Because of the very recent attainment demonstration, with its showing that 2007 was the target attainment demonstration, 2007 is retained as one attainment “maintenance” inventory. Because the CAA requires a 10-year window for an initial maintenance demonstration, 2012 is a new inventory year and sets an emissions budget for transportation conformity purposes.

The redesignation inventory focuses on volatile organic compounds (VOC) and nitrogen oxide compounds (NO_x) emissions – the principal ozone precursors. Carbon monoxide (CO) also functions in ozone formation as a less reactive VOC. It is almost exclusively generated by incomplete combustion, and dominated by vehicle (and engine) sources. Its emission trend tends to follow vehicle VOC emission trends. For ozone inventory and planning purposes, change in vehicle VOC emissions is used as a surrogate for characterizing the potential CO impact on ozone. As a consequence, EPA does not require areas to separately track it for redesignation and attainment maintenance considerations.

When appropriate, the VOC and NO_x inventories have been re-estimated for the redesignation effort using more current assumptions than prior inventories covering the same years. The inventories contain daily emission estimates typical for the summer ozone season. To ensure consistency sufficient for characterizing long term emission trends, a baseline 1999 inventory was built from the most recently reported and calculated activity levels. A re-calculated 1990 inventory, using more current assumptions was built for the historic comparison. The 1999 inventory was projected to 2007 and 2012. The inventories are crafted for each of 4 sectors – mobile (on-road), non-road, area and point - using techniques specific to the sector. A full description of inventory assumptions for the 4 years is contained in ***Appendix 4-1 Redesignation Inventories***.

Table 4-1 provides a summary of the inventory by pollutant, by major sector, for each of the three nonattainment areas and for the two maintenance areas that are the subject of this redesignation request. A single summary estimate for the entire 10 county area is included for informational purposes. **Figures B-1 and B-2** show the historic and projected trend in VOC and NO_x emissions over the 22 year period – 1990-2012 for the aggregate area.

Redesignation Inventories – Table 4-1

	VOC					NO _x				
1990	Point	Area	Non-Road	Mobile	Totals	Point	Area	Non-Road	Mobile	Totals
6 County (Milw CMSA)	40.4	132.2	39.9	139.3	351.7	130.5	21.6	42.1	111.2	305.4
Sheboygan Co	6.7	9.7	3.1	10.0	29.5	56.4	1.7	5.2	11.0	74.2
Manitowoc Co	1.2	8.8	2.3	8.1	20.3	3.2	1.1	1.9	10.4	16.6
Kewaunee Co	0.9	1.8	0.8	1.5	4.9	0.0	0.2	0.5	1.5	2.2
Door Co	0.0	5.7	4.1	2.6	12.4	0.0	0.4	0.8	3.3	4.5
Totals	49.1	158.3	50.1	161.3	418.9	190.1	24.9	50.5	137.5	403.0
1999	Point	Area	Non-Road	Mobile	Totals	Point	Area	Non-Road	Mobile	Totals
6 County (Milw CMSA)	19.8	95.0	39.9	51.6	206.3	120.9	15.4	52.2	130.5	319.0
Sheboygan Co	2.9	6.8	3.3	4.6	17.6	47.6	1.4	6.2	11.8	67.1
Manitowoc Co	1.9	5.9	2.3	5.1	15.2	3.4	0.8	2.5	11.0	17.7
Kewaunee Co	0.6	1.1	0.8	1.0	3.5	0.0	0.1	0.6	1.7	2.5
Door Co	0.1	2.4	4.4	1.8	8.8	0.0	0.2	1.0	3.6	4.8
Totals	25.4	111.2	50.7	64.0	251.4	171.9	18.0	62.5	158.6	411.0
2007	Point	Area	Non-Road	Mobile	Totals	Point	Area	Non-Road	Mobile	Totals
6 County (Milw CMSA)	22.9	101.3	26.7	31.8	182.7	102.0	16.0	51.9	70.0	239.9
Sheboygan Co	3.4	7.1	2.7	3.4	16.5	25.0	1.5	6.0	7.2	39.7
Manitowoc Co	2.2	6.1	1.7	5.1	15.2	3.1	0.8	2.4	8.9	15.1
Kewaunee Co	0.7	1.2	0.6	0.9	3.4	0.0	0.2	0.6	1.3	2.0
Door Co	0.2	2.4	4.0	1.8	8.3	0.0	0.2	1.1	2.6	3.9
Totals	29.4	118.1	35.7	42.9	226.0	130.1	18.7	62.0	90.0	300.8
2012	Point	Area	Non-Road	Mobile	Totals	Point	Area	Non-Road	Mobile	Totals
6 County (Milw CMSA)	24.9	103.9	22.1	21.4	172.2	109.6	16.3	53.1	41.7	220.7
Sheboygan Co	3.7	7.3	2.5	2.5	15.9	26.9	1.5	6.0	5.0	39.5
Manitowoc Co	2.4	6.3	1.5	5.0	15.2	3.3	0.8	2.4	7.9	14.4
Kewaunee Co	0.7	1.2	0.5	0.9	3.3	0.0	0.2	0.6	1.1	1.9
Door Co	0.2	2.4	3.7	1.7	8.1	0.0	0.2	1.1	2.3	3.7
Totals	31.9	121.0	30.3	31.5	214.7	139.9	19.0	63.2	58.0	280.1

The trends in **Table 4-1** and **Figures 4-1** and **4-2** show a strong VOC emissions decrease over the period 1990-1999 concurrent with a much smaller NO_x increase over the same period. This is consistent with the VOC-focused control effort that is detailed further in the chapter. Additionally, both VOC and NO_x are projected to decrease over the period 1999-2012. For NO_x, the decrease is quite significant for the projected maintenance years.

Finally, the aggregate projected 2007 maintenance inventories are relatively consistent with those projected for Wisconsin areas for the attainment year in the attainment demonstration modeling. Differences are discussed in Chapter 5 – Maintaining 1-Hour attainment into the Future, and in **Appendix 5-2 – Reconciliation of 2007 Attainment and Maintenance Inventories**.

Figure 4-1: VOC Emissions in Tons per Ozone Season Day

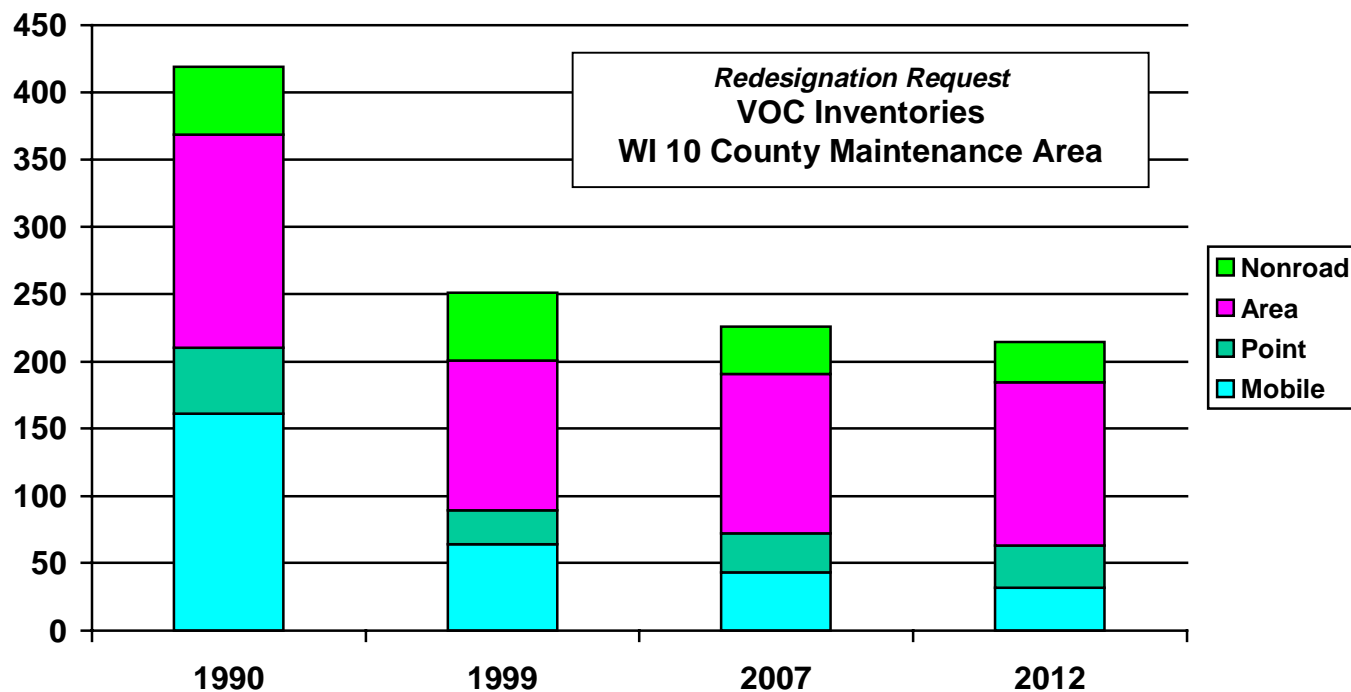
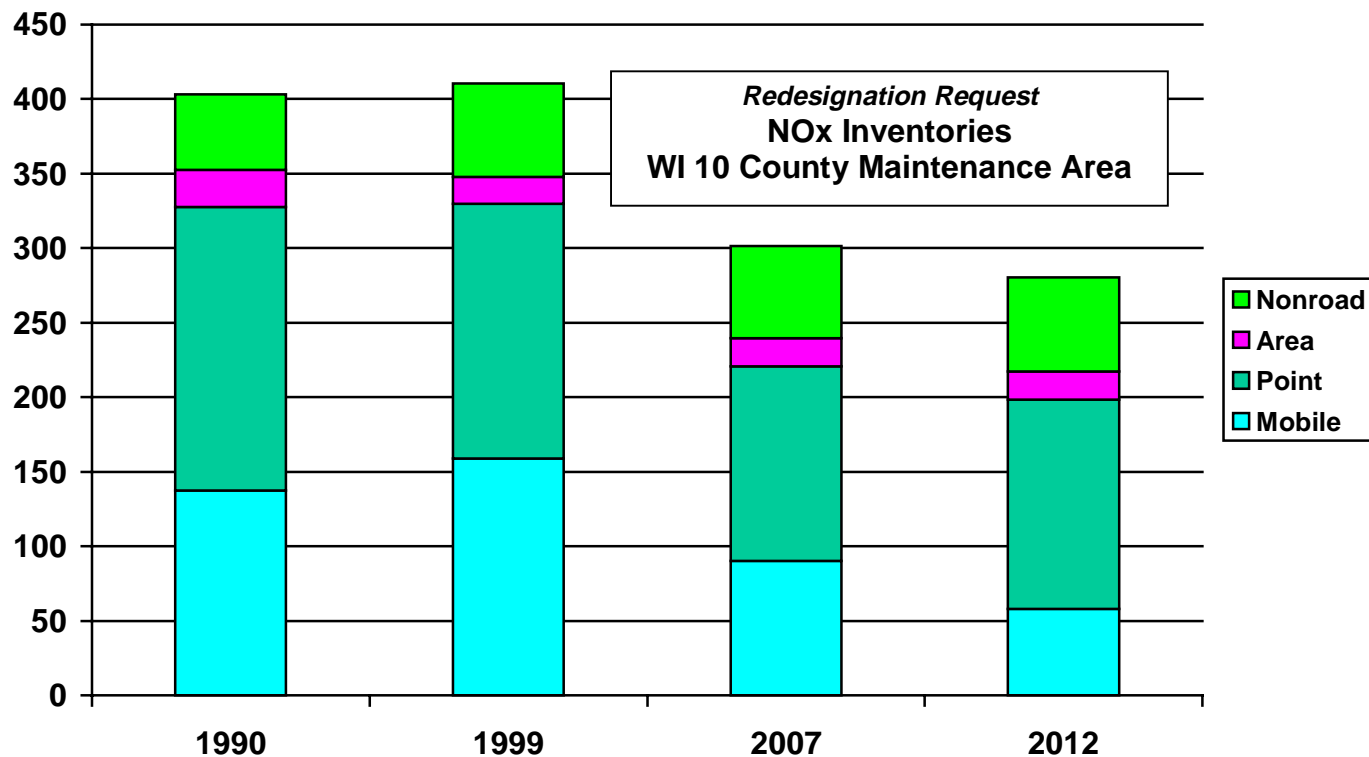


Figure 4-2: NOx Emissions in Tons per Ozone Season Day



C Fully-Approved WI Ozone Control SIP

Key Points:

- Provides a current reference list of the major state-adopted control measures (incl. RACT, I/M, 15% plan, Rate-of-Progress [ROP] and NO_x control) in the active SIP
- Briefly notes the major federal programs impacting WI emissions
- Briefly notes regional emissions control programs
- Briefly notes the approved regional attainment demonstration plan (taken from the approved 12/2000 submittal)

Ozone has been a well-recognized air quality and public health problem in eastern Wisconsin since EPA promulgated an ambient air quality standard for ozone in the late 1970s. The state has consistently pursued ozone control program implementation following the requirements of the Federal Clean Air Act (CAA). After the CAA-90 amendments, and its Severe designations for the 5 county Milwaukee CMSA and the IL-IN-WI Chicago CMSA (including Kenosha County), Wisconsin has pursued a series of SIP updates to address CAA-specified programs, to fulfill VOC RACT requirements and to meet Rate-of-Progress (ROP) emission reduction obligations.

In concert with its immediate upwind neighbors, Illinois and Indiana, the state endeavored to craft a final series of Ozone Attainment Demonstration SIPs from 1994 through 2000. That effort entailed substantial technical development of regional evaluation expertise through the LADCO technical group. The third iteration submittals, based on modeled regional attainment for the year 2007, was fully approved by US-EPA in October 2001.

The overall ozone control strategy initially pursued a VOC control program focus. As part of the evaluations and planning efforts the states received approvals for waivers to the early specified NO_x reductions in Section 182 – primarily NO_x RACT and the NO_x portion of Enhanced I/M. The final attainment demonstrations include a substantial regional NO_x reduction component, focused on the largest combustion sources, and, in Wisconsin, activation of the NO_x testing component of its I/M program.

Wisconsin's Subpart 2 (Section 182) Ozone Control SIP is fully approved and contains all federally required emission control programs related to ozone. A list of the major required SIP components is shown in **Table 4-2. Appendix 4-2 - A Real and Permanent Emissions Reduction Demonstration**, lists the major state and federal control program components of Wisconsin's Approved Ozone Attainment SIP in Table 1, providing information on year of submittal and approval and most recent status.

Table 4-2

Submitted and Approved Section 182 (Subpart 2) SIP Elements-Major Ozone Control Programs and Attainment Demonstration
Governor's Proposed Designations (under CAA-90) – 6 Ozone Areas
Permit Program Upgrades – NSR, PSD, etc.
RACT Fix-up Package (pre-1990)
SIP Planning, Inventory and Emission Statement Updates
VMT Emissions Growth Offset/Demonstration Package
CAA-90 VOC RACT, CTG & ACT Rules – Core Elements
I/M Program – Expansion and Upgrades to Enhanced Program

Stage 2 Vapor Recovery Program
15% (1996) ROP and Contingent Measures Plan – VOC Controls
Phase 1 Attainment Demonstration – Commitment to Regional Effort
9% - Post-96 (1999) ROP and Contingent Measures Plan – VOC Controls
Phase-2 Attainment Demonstration and Commitments
Post-1999 ROP Plan (2002,2005,2007)
2000 Regional Attainment Demonstration for 2007 – Phase 3
Excess VOC Emissions Fee for Post-2007 NA
Maintenance Plans and Contingent Measures List – Attainment Areas (Sheboygan, Kewaunee, Walworth Counties)

D Real and Permanent Regional Air Quality Improvement

Key Points:

- *Provides estimated impact of major state-adopted control measures (incl. RACT, IM, 15% plan, ROP and NOx control) in the active SIP – 1990-1999*
- *Provides estimated impact of the major federal programs impacting WI ozone levels – 1990-1999*
- *Provide regional emissions trend comparison*
- *Provide brief synopsis of regional economic, electric generation and travel trends*
- *Discussion linking the regional emissions reduction trend to the WI air quality trend*

Real Reductions based on Precursor Control Programs – 1990-2001

Substantial VOC emissions control has been demonstrated over the last decade since the CAA-90 designated ozone areas as nonattainment. The reduction effect from all the noted programs was particularly significant during the period 1990-1999. As shown in the inventories, VOC reduction from all factors far outstripped emission increases over the period associated with economic growth and regional travel increase.

For NOx, aggregate emissions slightly increased over that period at both the state and regional level, started to drop regionally during 1999-2001, and, will drop more significantly throughout the maintenance period of 2002-2012. Projected reductions are based on federal vehicle, engine and fuel standards coming on line and the implementation of the NOx control programs promulgated to meet attainment in 2007. For Illinois and Indiana, these also represent a response to the NOx SIP call.

The region focused control strategies first on more localized VOC control meeting the Section 182 requirements for progress and all federally-mandated state controls. Modeling indicated a need to focus early control effort on VOC reduction. The Lake Michigan region developed, received approval and successfully upheld a challenge to a waiver for specified NOx controls under Section 182f. As part of the Attainment Demonstrations, portions of the NOx waiver were changed, but for the residual components, the waiver remained intact.

A major reason for the small NOx emission increase seen during the 1990's was the post-certification application of "diesel-defeat" devices that increased proportionate NOx emissions on heavy-duty diesel trucks. In addition, these vehicles increased in relative fleet-mix and in total travel compared to projections made earlier in the decade. US-

EPA has subsequently obtained enforceable consent decrees from the truck manufacturing industry to stop the illegal modification of these diesel engines and to rebuild a substantial portion of this fleet and to speed the introduction of vehicles meeting lower NOx emission standards. The impact of these actions will be a rapid decline in NOx emissions projected for the fleet and reflected in US_EPA's newest MOBILE emissions model. The trend of rapid NOx emissions decline for the heavy diesel fleet started in 1999 after rising until that time and will continue through the maintenance period.

The second major reason for the NOx emissions increase was the expanded loading of major coal-fired electric generation facilities during the decade. These facilities are now subject to NOx emission limits resulting in significant emission reductions through the demonstrated attainment year of 2007. This SIP revision encompasses a redesignation proposal and maintenance plan that retains the NOx emission reduction requirements projected through 2007.

Wisconsin believes that the focused VOC control programs between 1990-99 define the real and permanent controls necessary to demonstrate achievement of attainment status. Going forward, the region as a whole has committed in its control programs to ensure that NOx emissions drop from 1999 levels sufficiently to ensure modeled attainment by 2007 and to maintain the 1-hour ozone standard throughout the 10 year maintenance period.

Appendix 4-2, A Real and Permanent Emissions Reduction Demonstration, details the approximate level of reductions based on the major emission control programs adopted over the period since designation. **Appendix 4-3, Mobile Sector Inventory Modeling Documentation**, provides technical detail for the mobile sector beyond the aggregate redesignation inventories synopsis contained in **Appendix 4-1**.

Illinois and Indiana have also effectively pursued and adopted emission control programs for their nonattainment areas in the Lake Michigan region adequate to meet rate-of-progress reductions for 1996, 1999 and going forward through 2007. Though regional NOx increased somewhat over that period, any detrimental air quality impact was overwhelmed by the far larger, and more important, VOC control efforts. NOx emissions on a regional basis varied little from 1999-2001, but will drop significantly between 2002 and 2007 based on the progress and attainment programs. **Figures 4-3 and 4-4** highlight the regional emissions trend associated with the redesignation request. These are based on draft-final inventory estimates for the individual state requests. Little change is expected in the final inventory numbers compared to these working drafts and no change is expected for portrayed regional trends.

Regional Emissions Trend

